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## NOISE ELEMENT

OCTOBER 1975



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# NOISE ELEMENT

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# PREFACE

The Noise Element was developed out of the cooperative efforts of the consulting firm of Olson Laboratories and the Interdepartmental Noise Study Committee, chaired by the Health Officer. Members of the committee included representatives from the Airport, Building and Safety, Planning and Road Departments. The committee was recognized by the Board of Supervisors in October 1973. Actual work on the element was begun by the consultant in August 1974 and completed in April 1975. The format and scope of the element were the primary responsibility of the Environmental Management Agency.

# SUMMARY

Section 65302 of the Government Code requires each planning agency to develop a Noise Element as part of its mandated general plan. The document identifies sources of noise and estimates their potential impact on the planning area. This information forms the basis for goals and policies to preserve or restore a noise environment consistent with the preservation of the health and welfare of Orange County citizens.

Problems and issues are identified, noise measurement indices proposed and jurisdictional responsibility discussed.

Planning guidelines, including noise contour data and a land use/noise compatibility chart are discussed as suggested means for implementing the Noise Element.

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# I. INTRODUCTION

## A. PROBLEM STATEMENT

Since the advent of the industrial age, people have been exposed to increasingly undesirable by-products of technology. Air and water pollution have long been considered major problems. Noise is now recognized as a third major pollutant.

Unfortunately ears, unlike eyes, have no device to shut out unwanted stimuli. With the absence of a shielding mechanism similar to the eyelid, people are exposed 24 hours a day to a vast array of sounds in the acoustical environment. The major effects have been that people suffer annoyance, inconvenience and temporary or permanent hearing loss because of noise.

Fortunately, information is currently available to take prudent and much needed measures to protect the community against the effects of noise pollution. If this information is accurately interpreted and properly applied, it can provide decision makers with an effective planning tool to eliminate or reduce the adverse effects of noise in the community.

The existing noise situation and the expected future growth in the County make it imperative to include noise considerations at various stages of the planning process in order to minimize the ill effects associated with noise.

## B. LEGISLATIVE MANDATE

Section 65302(g) of the California Government Code requires each city and county in California to adopt a Noise Element for incorporation into its General Plan. Section 65302(g) states that the General Plan shall include:

A noise element in quantitative, numerical terms showing contours of present and projected levels associated with all existing

and proposed major transportation elements.

The Section also qualifies the manner in which contours may be expressed and requires that the element include conclusions regarding noise impact on transportation site selection and compatible land uses.

#### C. SCOPE AND PURPOSE

The scope of the study includes the unincorporated portions of the County of Orange.

The purpose of the Noise Element is to provide a statement of public policy and a decision framework for the maintenance of a quiet environment. The Noise Element identifies the sources of noise, analyzes the extent of the noise intrusion and estimates its potential impact upon the County. This identification process in turn provides the basis for goals, policies and suggested implementation strategies designed to preserve, where possible, a quiet environment in the County of Orange.

The objectives achieved by the development of the Noise Element are:

- o The identification in quantitative, numerical terms, of existing and projected noise levels, noise sources, and noise-sensitive land uses in the County.
- o Direction for an implementation program which may be used to achieve and maintain a desirable noise environment.

#### D. GENERAL PLAN

The General Plan has become an important instrument which elected officials can use to provide policy guidance for more detailed planning and implementation. To some degree, all elements of the General Plan are related and interdependent. The Noise Element is closely related to a number of other elements of the General Plan, primarily Land Use, Circulation, Housing and Open Space and Conservation as shown in Figure 1.



The Land Use and Noise Elements are strongly inter-related. The proposed noise element identifies land uses which are considered sensitive to noise and suggests compatibility guidelines for land use and noise levels. This information is intended to provide guidance to land use decisions including the general distribution, location and intensity of land uses.

A significant relationship also exists between Circulation and Noise Elements. Since transportation systems are a major source of noise, their location, capacity, and design will determine the extent of noise impacts on surrounding land uses. Once commitment is made on transportation systems, land uses should be examined to identify compatibility with noise levels generated by that system. The Noise Element relates to the Circulation Element through proposed policies for design, location, and fiscal consideration in new highway construction.

The Housing Element is indirectly affected by the Noise Element through the Land Use Element. Residences are identified as some of the most noise-sensitive uses. The Noise Element suggests location and design considerations for housing, as well as attenuation measures to reduce interior noise levels. Land that is considered marginal for residential use because of its noise condition may, assuming strict site plan review and governmental subsidy of attenuation measures, provide an opportunity for low and moderate income housing units.

The Noise Element is also closely related to the Conservation and Open Space Elements, since noise can adversely affect the enjoyment of quiet activities in open space. Conversely, open space can be employed to buffer noise-sensitive land uses through separation and extensive landscaping.



# NOISE ELEMENT

## INTERACTION WITH OTHER ELEMENTS

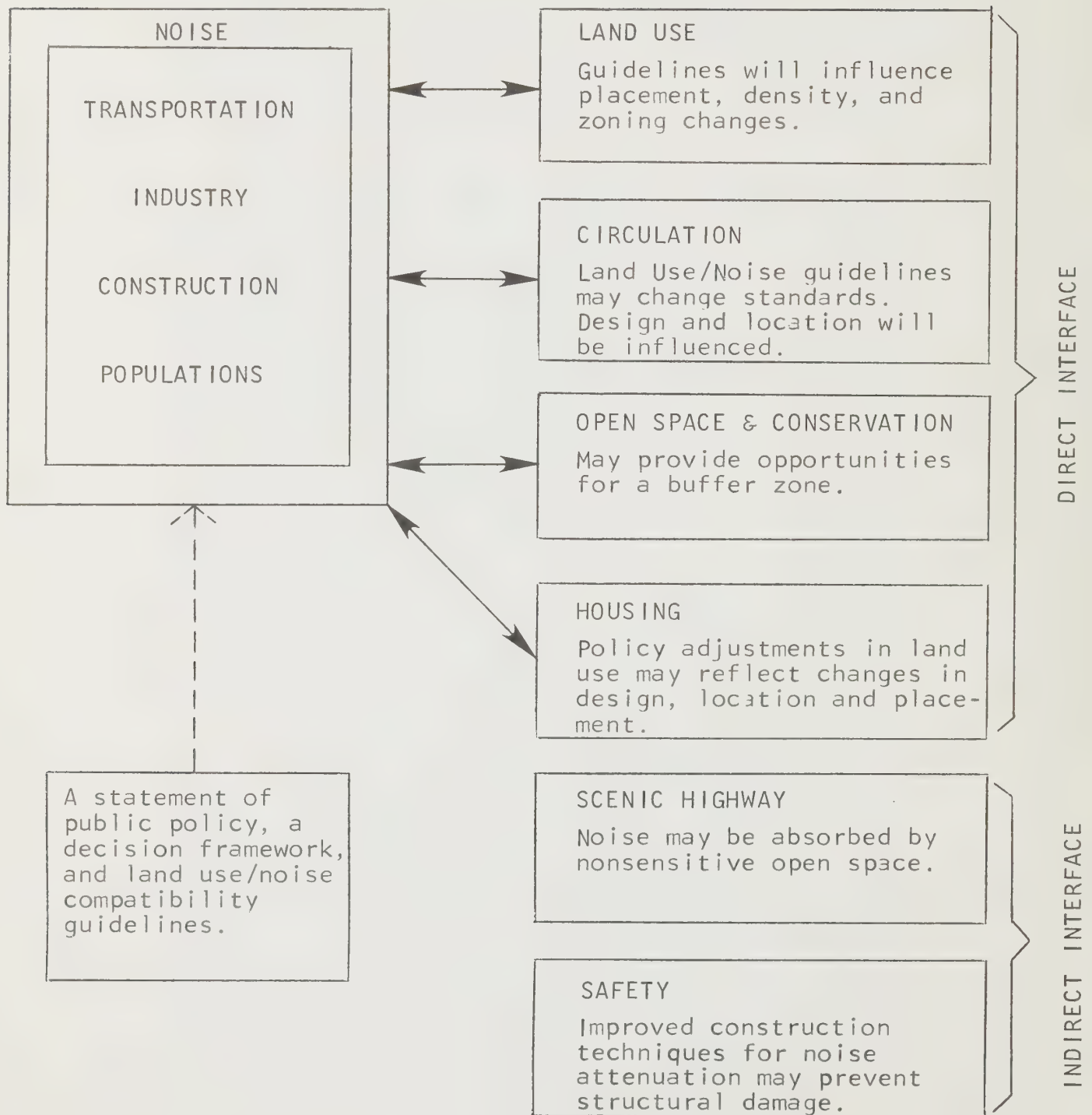


Figure 1. NOISE ELEMENT INTERFACE

## II. IDENTIFICATION OF EXISTING SITUATION

### A. THE NATURE OF SOUND

Sound is created when an object vibrates and radiates part of its energy as acoustic pressure waves through a medium such as air, water, or a solid. The ear allows reception of this acoustic pressure change, the amplification of faint signals, and conversion to impulses that are transmitted to the brain for interpretation.

Loud and soft, noisy and quiet, high and low-pitch are terms often used to describe sound. These terms are relative, however, and do not reflect the absolute magnitude or spectrum content of sound perceived by people. Sound is technically described in two ways:

- o Amplitude, power or loudness, in decibels (dB). The loudness of a sound depends on the pressure exerted by the sound waves. The greater the pressure, the louder the sound.
- o Frequency, or pitch, in Hertz (Hz). High frequency sounds are produced by rapidly vibrating objects and low frequency sounds by slowly vibrating objects.

Noise is rated in terms of its loudness and the standard unit of noise measurement is called the decibel (dB). An A-weighted decibel (dBA) compensates for the hearing sensitivity of humans by discriminating against the lower frequencies according to an approximate relationship to the sensitivity of the human ear.

Decibels are based on a logarithmic scale. A decibel level of zero is representative of the faintest sound audible to the average human ear. A sound 10 dBA higher than another is judged to be twice as loud; 20 dBA higher is four times as loud; and 30 dBA higher is eight times as loud.

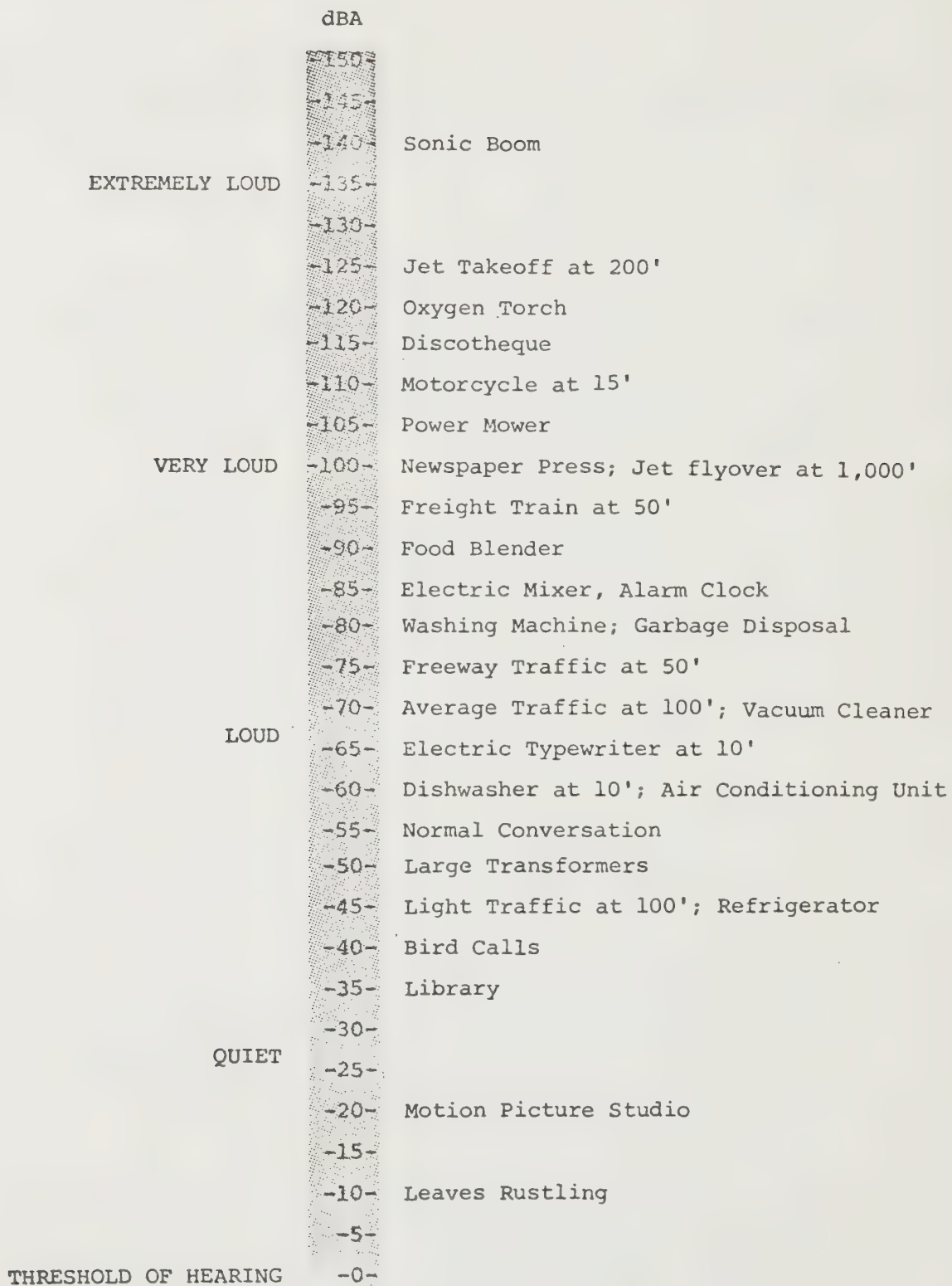


Figure 2. NOISE SCALE



Every day sounds normally range from 30 dB (very quiet) to 100 dB (very loud). The average level of conversation ranges from 60 to 80 decibels. Sound becomes discomforting at 120 decibels and physically painful above 140 decibels. Examples of various sound levels are shown in Figure 2.

The transmittal of sound involves three statistical components: source, transmission path, and receiver. These sound components are not independent, but experience considerable interaction. The output of the source will depend on both the path and the receiver. For example, a person (source) will raise his voice if he is aware that his listener (receiver) is hard of hearing. Figure 3 represents the transmission of sound from a source to a listener.



Figure 3.

The solid arrows represent a direct path and the broken lines indicate interaction between the components.

#### B. HUMAN NOISE RESPONSE

The effects of noise on people range from annoyance and inconvenience to temporary or permanent hearing loss. The Environmental Protection Agency has stated that some 80 million people are significantly impacted by noise, half of whom are exposed to levels that can damage their hearing or otherwise affect their health<sup>1</sup>.

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<sup>1</sup>U.S. Environmental Protection Agency, The Noise Control Act of 1972 Highlights, (Washington, D.C.: Printing Office, 1972), p.1.

Noise is not only detrimental to well-being, but also costly. The World Health Organization has estimated that over \$4 billion is spent by United States industry each year for noise-related absenteeism, reduced efficiency, workman's compensation claims, and mental illness.<sup>2</sup>

In addition to hearing loss, noise also can have a considerable effect on human activities such as communication, sleep and task performance, thereby contributing to annoyance and indirectly affecting the general state of an individual's health and well-being.

Certain age groups are particularly affected by an adverse noise environment. Older people usually have suffered from hearing loss over time and consequently have trouble defining certain sound levels. Young children have difficulty understanding adults because they have not learned to distinguish between the sounds of words and environmental noise. This can be a significant problem because many schools are situated near heavily traveled roadways. High noise levels can cause speech interference and thus impair learning ability and linguistic development.

Other physiological effects of noise are thought to be caused by psychological factors associated with an individual's subjective response (fear, frustration, etc.) to noise stimuli. These effects might include changes in blood pressure and cardiovascular volume, breathing and pulse rate, adrenal hormone secretion, and other somatic responses.<sup>3</sup> If adaptation does not occur and these negative reactions continue, the result may be deterioration in mental and physical health.

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<sup>2</sup>Hildebrand, "Noise Pollution: An Introduction to the Problem and an Outline for Future Legal Research," 70 Columbia Law Review, 652, (1970), p.653.

<sup>3</sup>Kryter, Karl D., "Non-Auditory Effects of Environmental Noise," American Journal of Public Health, Volume 62, No. 3, March 1972, pages 389-398.

One of the greatest problems in noise analysis is that of relating noise exposure to health and welfare, and determining adequate maximum noise levels for the protection of well-being. Although there has been some dispute in the scientific community regarding the detrimental effects of noise, a number of general conclusions have been reached:

1. Noises of sufficient intensity have caused irreversible hearing damage.
2. Noise has produced physiological changes in humans and animals that in many instances has not resulted in adaptation (i.e., noise can affect an individual's heartbeat, alter breathing, constrict blood vessels, and affect digestion).
3. The effects of noise are cumulative and, therefore, the levels and durations of noise exposure must be taken into account in any overall evaluation.
4. Noise can interfere with speech and other communication.
5. Noise can be a major source of annoyance by disturbing sleep, rest and relaxation.
6. When community noise levels have reached sufficient intensity, social action has occurred to reduce its effects. This has often resulted in new laws, ordinances and standards.<sup>4</sup>

In view of the state of knowledge concerning noise and the variability of human response to noise, the enactment of community noise programs is a difficult process. The search for meaningful standards must distinguish between what is merely interesting information and what is truly useful knowledge for the protection of the community welfare.

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<sup>4</sup>U.S.Environmental Protection Agency, The Social Impact of Noise December 1971, P.2.



Scientific certainty is rare; and a desire for this must be balanced with the real and immediate need for the protection of our environmental quality. Decisions, therefore, must be made in concert with the best knowledge currently available. As scientific findings emerge and community needs change, the decision-making process should incorporate and reflect those changes.

Fortunately, information is currently available to take prudent and much needed measures to protect the community against hearing loss, activity interference and annoyance. The Environmental Protection Agency has recently promulgated standards which, within a high degree of statistical confidence, can secure the public health and welfare against adverse noise effects.

If this information is accurately interpreted and properly applied, it can provide decision makers with an effective planning tool for the preparation of noise ordinances, building codes, and environmental impact reports, thus allowing a community to take a substantial step forward in the abatement and control of environmental noise. Caution must be exercised, however, in the application of most current standards. If applied too quickly some standards would produce severe disruptions in current lifestyles and economic conditions.

#### C. OPPORTUNITIES AND CONSTRAINTS

Some of the important opportunities for achieving an improved noise environment are:

1. The on-going noise programs in several County agencies and departments.

The Environmental Health Division of the Health Department developed and enforces the County's Noise Control Ordinance and is recommending that Orange County cities adopt the ordinance and contract with the Health Department to create a uniform noise enforcement program in the County. In addition, the Health Department evaluates land development projects, conditional use permits, variances and EIRs, coordinates County noise enforcement, maintains noise monitoring capability and conducts special noise studies.

Within the Environmental Management Agency, noise considerations are reflected in:

- a. The use of noise criteria in planning for future land uses and imposition of noise attenuating measures for specific development projects.
- b. Incorporation of citizen concerns about noise into the transportation planning process, including the preparation of several reports on the problem.
- c. Enforcement of the Uniform Building Code and the California Noise Insulation Standards.

The Orange County Airport Department has been very active in incorporating noise control measures at the Orange County Airport. An airport noise monitoring system has been in operation since June 1970. An environmental impact report is now being prepared on present and projected aircraft operations at Orange County Airport.

The Airport Land Use Commission has adopted a comprehensive land use plan for Orange County Airport and is in the process of preparing one for El Toro Marine Corps Air Station.

2. The commitment to noise associated concerns by the Board of Supervisors and Planning Commission as exhibited by establishment and support of County noise programs.
3. The growing State and Federal recognition of noise problems. This is exemplified by the HUD and EPA Standards, the State mandated Noise Element and the creation of the Office of Noise Abatement in the State Health Department.
4. The large areas of undeveloped land in the County where a preventive approach to noise is achievable.
5. A tradition of active citizen participation.

6. A tax base capable of financing expanded noise associated programs.

Some of the significant obstacles to achieving an improved noise environment are:

1. Many areas of noise control are preempted by the Federal and State Government.
2. Overlapping jurisdictional responsibilities and boundaries make a coordinated countywide approach to noise reduction difficult to achieve.
3. Limited public awareness of noise-related health hazards.
4. Potentially higher costs of expanded noise abatement programs and public resistance to increased government expenditures.
5. Several areas of the County contain existing land uses impacted by high noise levels.

#### D. ASSUMPTIONS

A number of variables affect the measurement and control of noise sources. There are thousands of permanent stationary noise sources and several hundred thousand transitory noise sources within any urban area. Transmission characteristics of sound are directly affected by the size, shape, and density of the thousands of barriers, structures, and topographical features in the County. Complicating this is the fact that localized meteorological conditions may distort the sound wave in unpredictable ways. For these reasons, the Noise Element is concerned with major predictable sound sources (such as airplanes, highways, and railroads), and takes a macroscopic view of the noise environment. Considerations of the distortions of the sound field by natural and man-made topological features were only generally considered in the evaluation of the noise descriptors in the context of this report.



# III. IDENTIFICATION OF PROBLEMS AND ISSUES

## A. NOISE AS A PROBLEM

It is important to ask how noise has become an environmental pollutant and why, until recently, little has been done to control it. Several of the factors which cause noise problems are shown in Figure 4. The primary problems, however, arise from people's attitudes and their lack of awareness of noise effects.

Noise is often equated with power (e.g., loud mufflers) and in many cases, persons refuse to buy quieter equipment which is identical in every other way to noisier machines. The result is noise which endangers the users hearing and performance while contributing to higher noise levels in the community.

People also believe they can adapt to noise. Normally, adaptation to environmental conditions is a common occurrence. Unfortunately there is little physical adjustment to noise by the human body. People may partially adjust to noise during sleep, for example, and not awaken; the quality of sleep, however, is lessened.

The inability to recognize noise problems because of these beliefs and attitudes, potentially exposes great numbers of our population to these hazards.

The complexity of noise has also limited the awareness of associated problems and issues. These involve the following factors: noise measurement indices and controls, multijurisdictional responsibility, the diversity of noise sources, land use/noise inter-relationships and the cost of noise abatement.

## B. NOISE MEASUREMENT INDICES

Noise from many sources varies over a period of time so that the noise level is not constant. Under conditions of varying time, sound is best expressed in statistical terms. Several rating indices have been

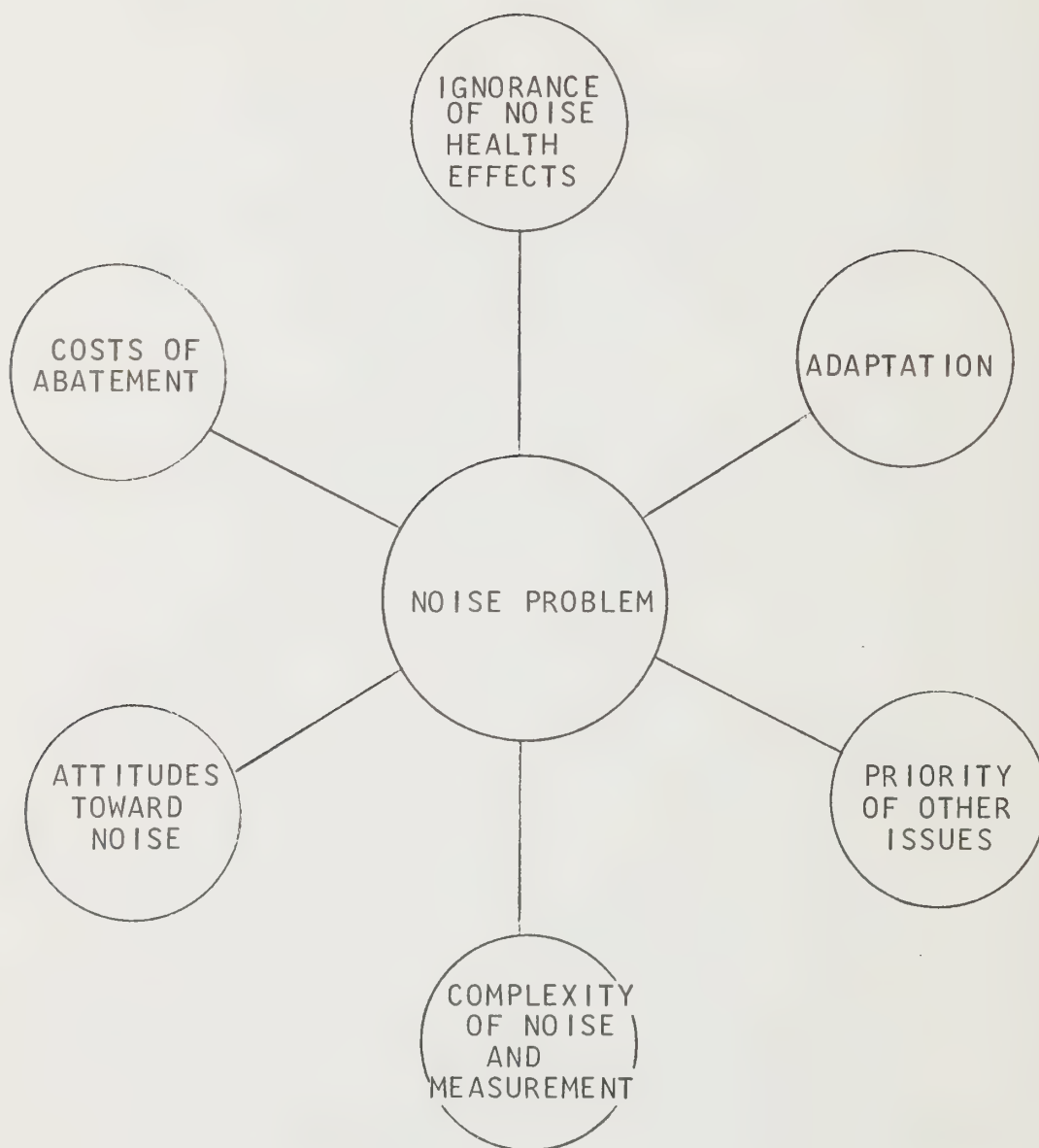


Figure 4. SOURCES OF THE NOISE PROBLEM

developed for the measurement of community noise. The predominate ones now in use in California are: Energy Mean Noise Level ( $L_{eq}$ ); Day-Night Average Sound Level ( $L_{dn}$ ); and Community Noise Equivalent Level (CNEL). These indices apply different weighting factors to noise occurring at various times of the day. Thus when a noise level is given for a particular location, it is important to know what statistical variable is described by that value.

The CNEL index was used in the Noise Element for several reasons. It satisfies the State requirement that the acoustical scale include both magnitude of noise and frequency of occurrence. It incorporates factors of amplitude and spectral distribution of noise, sensitivity of the human ear, duration of noise events, and time of day weighting factors.

The CNEL index is also the method of airport noise description accepted by the Southern California Association of Governments and the California Department of Aeronautics for environmental impact reports. It is the current planning index used by the Orange County Airport, the EMA, the Planning Commission, and the Airport Land Use Commission.

A further value of this index is that it produces values within one decibel of  $L_{dn}$  values which is the index recommended by the Environmental Protection Agency.  $L_{dn}$  can be used interchangeably with CNEL if there are not a significant number of events that occur between the evening hours, i.e., 7:00 p.m. to 10:00 p.m., since one decibel is well within the absolute accuracy of the CNEL prediction.

#### C. MULTIJURISDICTIONAL RESPONSIBILITY

The responsibility for the control of noise is divided among all levels of government, local, State, and Federal. In many instances, Federal and State laws preempt local government from controlling certain noise sources by establishing maximum noise levels and operational procedures for motor vehicles, interstate carriers (trucks and railroads) and aircraft. In some instances where preemption exists, the local government assumes the role of enforcing the levels established by the State or Federal government (e.g., State Airport Noise Control Standards). In other

local government is excluded from the regulatory process (e.g., single event aircraft noise emissions).

Other noise control options are available to local governments, such as, if they have jurisdictional authority, they may prevent certain types of aircraft from using an airport or restrict truck traffic patterns on surface streets. The path of noise can be altered by construction of walls, landscaping or buffer zones. Future noise problems can be minimized through the combined efforts of land use/noise compatibility planning, zoning, subdivision review, building codes enforcement, noise ordinances, and policies directed toward controlling and reducing noise in the community.

Unfortunately, noise does not respect jurisdictional boundaries and noise generated in one community may affect another. It is essential, therefore, that all levels of government cooperate if the maximum obtainable reduction of noise is to be achieved.

#### D. DIVERSITY OF NOISE SOURCES

Noise is generated by numerous sources which are found near places where people both live and work. Of particular concern are those sources generating noise levels above the background noise level that exists in the County.

The most common "non-fixed" noise sources in the community are transportation-related (automobiles, trucks, motorcycles, railroads, and aircraft). Motor vehicle noise is of concern because it is characterized by a high frequency of events, short duration, and proximity to areas sensitive to noise exposure. Rail transit and aircraft operations, though infrequent, generate extremely high noise levels which are disruptive to human activity. Air transportation noise appears to produce the greatest community anti-noise response. Typical sound levels of ground transportation are shown on Table 1.



Table 1<sup>5</sup>

Transportation Vehicle	Typical Sound Level (dBA) at 50 feet
1. Automobiles (passenger)	69
2. Trucks (light and pickup)	72
3. Buses (city and school)	73
4. Automobiles (sports and compact)	75
5. Motorcycles (highway)	82
6. Buses (highway)	82
7. Trucks (medium and heavy)	84
8. Motorcycles (off-road)	85
9. Snowmobiles	85

#### E. LAND USE/NOISE COMPATIBILITY PLANNING

A local jurisdiction has the greatest opportunity to achieve noise control and abatement through effective land use and transportation planning. Unfortunately the integration of land use/noise compatibility planning is relatively new. As a result, noise-sensitive uses such as residences, schools, and hospitals have developed near major noise sources (freeways and airports).

Noise is now recognized as an important consideration in planning because of its impact on human health and amenity. Noise affects the livability and design of the environment. Specifically, noise can impair the economic health and growth potential of an area by generally reducing its desirability as a place to live.

Other noise sources in a community include industry, construction; and people and are often referred to as "fixed" sources. Industrial noise, generated by processing and operations, is usually of long duration at relatively low frequencies.

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<sup>5</sup>"Identification of Products as Major Sources of Noise": Environmental Protection Agency, Noise Regulation Reporter, BNA, June 24, 1974.

Construction sources (diesel engines, air compressors, electric motors, etc.) generate noise for extended periods of time with intermittent high noise levels as shown on Table 2. Population noise represents the noise generated by human activity in the community. Sources include air conditioners, lawn mowers, radio/stereo/television, sports arenas, schools and other entertainment and commercial activities.

Table 2<sup>6</sup>

Construction Equipment	Typical Sound Level (dBA) at 50 feet
Generator	76
Pump	76
Portable air compressors	81
Concrete mixer (truck)	85
Pneumatic tools	85
Backhoe	85
Dozer	87
Scraper	88
Dump truck	88
Paver	89
Rock drill	98
Piledriver	101

Land use controls are particularly effective when applied to undeveloped areas especially in the vicinity of freeways or airports. Unfortunately, many land use and transportation studies are done independently which results in difficult compromises in planning and locating both land uses and transportation facilities.

The integration of land use/noise compatibility planning will reduce the ultimate costs of noise pollution. Remedial noise abatement measures are much more costly and difficult to implement.

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6

Ibid.

## F. DISTRIBUTION OF COSTS

As with most forms of environmental pollution, prevention of noise-related hazards may entail high economic costs. Justification of these costs comes, however, from protecting human health and reducing the physical and mental damage associated with noise.

With a growing State and Federal presence in the noise field, the County must be alert to new proposals or changes in existing regulations and funding to protect its vital interest. Since new freeways must be acoustically treated, this cost is currently being absorbed by State and/or Federal funds.<sup>7</sup> Similarly, State and Federal highways needing remedial treatment are also funded by these levels of government.

The major budgetary noise control expenses to County government will arise from administering and coordinating noise programs, and policing noise problems. These activities are already being carried out by various County departments.

Costs can be passed on to the public directly through increased County taxation, or indirectly through State or Federal subsidy. Some regulations will impact industry which also passes on higher production costs.<sup>8</sup> The proposed EPA equipment purchase guidelines<sup>8</sup> will be felt by the consumer in products such as cars, appliances, and tools and by the county in the purchasing of equipment.

One of the ways to assess the cost of noise is in terms of hearing loss. If Orange County follows the national average, about four percent of the current population or 64,000 persons, will suffer some form of hearing loss. If all these people were compensated at rates similar to the provisions of California disability insurance for a period of 20 years, the cost would be eight billion. While the costs associated with hearing loss are extremely important, the

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<sup>7</sup>California Department of Transportation, Policy and Procedure memorandum No. P74-47, July 24, 1974.

<sup>8</sup>Code of Federal Regulations, Title 40, Parts 203.0-203.8, March 25, 1974.

the costs of annoyance, human pain, and suffering should also be considered.

#### G. NEEDS AND DEFICIENCIES

An important step in the preparation of the Noise Element is the identification of existing and projected areas within Orange County that are affected by noise. The identification process included the analysis of surface and air transportation data and the measurement survey data.

Contours were developed from surface and transportation data, and overlaid on existing and projected land use data. Due to the nature of the data and the topographical features of the county, the actual noise levels are less extensive than shown on the contour maps for ground traffic. The broad contour coverage, however, especially for projected conditions, and the measurement survey data, point the direction of needed noise abatement.

Noise in Orange County affects all types of land use. The most noise-sensitive land use, however, is residential due to structural design and habitation. Other noise-sensitive land uses include school sites, hospitals, churches, and some other open space uses.

The major continuing noise sources now and in the future will be produced by transportation facilities (i.e., highways, rail lines, and airports). In order that citizens may be assured that exposure to unsafe noise levels is controlled, and that adequate consideration of abatement techniques are considered, it is necessary to establish a means of identifying all existing or proposed land uses which are or potentially will be noise impacted.



## IV. GOALS AND POLICIES

### A. LAND USE ELEMENT GOALS AND POLICIES

Certain goals and policies of the Orange County General Plan Land Use Element relate to noise. They are:

#### 1. Goals

- o Health - Good physical and mental health for all County residents.<sup>9</sup>
- o Environmental Quality - Optimum sustainable environmental quality with respect to air, water, sound levels, and plant life.<sup>10</sup>

#### 2. Policy

- o Residential Land Use and Housing - To generally restrict residential uses from areas subject to consistently high noise levels.<sup>11</sup>

### B. NOISE ELEMENT GOALS AND POLICIES

The goals and policies of the Noise Element have been selected to provide guidance for implementing the proposals of the element and to become the focal point for noise in the General Plan. They are:

#### 1. Goal

- o Protect the health, safety, and general welfare of County residents by reducing noise levels and establishing compatible land uses in noise impacted areas.

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<sup>9</sup> Land Use Element - Goals for the Human Environment

<sup>10</sup> Land Use Element - Goals for the Physical Environment.

<sup>11</sup> Land Use Element - Top Level Policies

## 2. Policies

It is the policy of the County of Orange:

(1) To cooperate with other County agencies and levels of government to bring about a comprehensive and coordinated effort to reduce noise levels.

1.1 To recommend needed changes in Federal and State Legislation which will be effective in reducing noise and can be efficiently administered.

1.2 To cooperate in efforts to develop mechanisms to assure coordination of all governmental jurisdictions in the field of noise control.

1.3 To review equipment noise standards and labeling established by the Federal government for possible adoption.

(2) To encourage the control of noise from transportation systems as the most efficient and effective means of reducing noise at the source.

2.1 To enforce noise sections of the State Motor Vehicle Code.

2.2 To encourage the State to require adequate noise suppression devices (mufflers, etc.) for all motor vehicles operated within the County.

2.3 To restrict the use of trailbikes, mini-bikes and other off-road motor vehicles in areas of the County except where designated for that purpose.

2.4 To study commercial truck movements and operations in the County and establish truck routes away from noise-sensitive areas where feasible.

2.5 To encourage development of a mass multi-modal transit system with reduced

noise emission characteristics.

- 2.6 To review the Federal Railroad Noise Standards of 1974 for possible adoption by Orange County.
  - 2.7 To continue the current policy of encouraging the use of noise reducing modifications to jet engines and the use of quieter jet aircraft at Orange County Airport.
  - 2.8 To employ noise mitigation measures in the design of new arterials consistent with funding capability and to support efforts by the State Department of Transportation for remedial acoustical protection for existing highways where needed by the County.
- (3) To fully integrate noise considerations in land use planning to prevent incompatible noise/land use conflicts.
- 3.1 To establish criteria of acceptable noise levels for various types of land uses and utilize them in future planning efforts.
  - 3.2 To limit noise-sensitive land uses such as residences, hospitals, convalescent homes, churches and schools within areas within the 65 CNEL.
  - 3.3 To insure that residential developments in areas with a 65 CNEL or higher are not approved until the Orange County Health Officer verifies to the Planning Commission that the noise analysis is technically adequate and that adverse health impacts, if any can be adequately mitigated.<sup>12</sup>
  - 3.4 To stress the importance of building and design techniques in future site planning for noise reduction.

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<sup>12</sup>Land Use Element - Top Level Policies

3.5 To utilize the California Noise Standards for Airports in planning for areas surrounding military as well as civilian airports.

(4) Monitor noise levels, adopt and enforce noise abatement programs.

4.1 To enforce the County's Noise Ordinance to prohibit or mitigate harmful and unnecessary noise within the County.

4.2 To encourage Orange County cities to adopt the County's model noise ordinance.

4.3 To develop and enforce standards in addition to those presently included in the Noise Ordinance to regulate noise from construction and maintenance activities and commercial, public, and industrial land uses.

4.4 To consider noise reduction as a factor in the purchase of County maintenance equipment and the use of such equipment by County contractors and permittees.

4.5 To require that noise from motors, appliances, air conditioners, and other consumer products does not disturb the occupants of surrounding properties.

4.6 To further identify other noise producing sources such as helicopter operations as part of the first amendment to the Noise Element.

(5) Identify and employ mitigation measures to reduce the impact of noise levels on sensitive land uses.

5.1 To encourage all property owners within the identified Noise Referral Zones (see page 32) to acoustically insulate all living quarters. This will be optional to the property owner.



- 5.2 To continue enforcement of Chapter 35 of the Uniform Building Code, 1973 Edition, and the California Noise Insulation Standards.
  - 5.3 To require that all new residential units have an interior noise level in living areas that is not greater than 45 CNEL, it being understood that standard construction practices reduce the noise level by 15 CNEL with the windows open and 20 CNEL with the windows closed.
  - 5.4 To encourage acoustical insulation programs for schools located in the County.
  - 5.5 To develop interior noise standards for land uses other than residential.
- (6) To disseminate public information regarding noise and programs to reduce noise levels and their impacts.
- 6.1 To provide information to the public regarding the health effects of high noise levels and means of mitigating such levels.
  - 6.2 To provide information regarding Noise Referral Zones and noise attenuation measures to developers and the public.
  - 6.2 To cooperate with industry to develop public information programs on noise abatement.



## V. PLAN CONCEPTS AND STRATEGIES

Existing and projected noise analyses indicate that residents of the County are or will be exposed to increasing noise levels that are hazardous to health and well-being.

As a first priority to achieve the goal and implement the policies of the Noise Element, the County should concentrate on the following suggested plan concepts and strategies.

- o Maintain existing County noise programs and standards and encourage other jurisdictions in the County to adopt similar noise programs and criteria.
- o Investigate land use/noise compatibility planning guidelines for possible use in County decision making.
- o Investigate alternative programs for the measurable reduction of noise.

### A. EXISTING PROGRAMS

Numerous programs are already being implemented to achieve noise control and abatement at all levels of government. Although these existing programs provide the greatest opportunity for implementing the goals and policies of the Noise Element, a fully coordinated and integrated approach to noise control is lacking.

Within the County departments and agencies (e.g., Airport, Sheriff, Environmental Management Agency, Health, etc.) noise considerations are made either as part of mandated state or Federal programs or are self-initiated.

## B. SUGGESTED PLANNING GUIDELINES

Effective implementation programs for the County of Orange should rely on standards and criteria. There are many bases for defining "quiet" or protecting public health from the adverse effects of noise. Whatever base is chosen, public policy must be clearly supported by substantial scientific evidence.

A study by the Environmental Protection Agency has established that nearly 100 percent of the population will be protected against loss of hearing if the daily dosage of noise does not exceed 70 Leq(24) (equivalent to 76 CNEL).<sup>13</sup> The study further established that reliable speech and sleep are the human activities that rank highest in the priorities for a desirable environment. The study also shows that extremely reliable speech (55 dBA) and undisturbed sleep (45 dBA) are possible with noise levels below conditions equivalent to a continuous noise level of 55 dBA during the day (7 a.m. to 7 p.m.), 50 dBA level during the evening (7 p.m. to 10 p.m.) and 45 dBA at night (10 p.m. to 7 a.m.). The day, evening and night conditions can be combined into a single 24-hour figure of CNEL = 55 for the exterior environment. An interior environment of 45 CNEL is considered desirable, as established by the California Noise Insulation Standards.<sup>14</sup>

Planning guidelines provide more flexibility than the preceding health criteria by considering technological feasibility and economic viability in addition to hearing loss and reliable speech communication and sleep.

Most importantly, planning guidelines provide a pre-ventive approach to noise pollution. They allow

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<sup>13</sup> U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974.

<sup>14</sup> California Administrative Code, Title 25, Chapter 1, Subchapter 1, Article 4; Adopted February 22, 1974.



agencies to review new land uses and redevelopment action in relation to compatibility with noise standards.

Figure 5 analyzes the major land use designations of the Land Use Element of the General Plan in terms of noise sensitivity. For each land use designation, CNEL levels are classified into three review categories.

Residential land use is the most sensitive because of the nature of activities which occur over a 24-hour period. An upper limit of 65 CNEL was chosen above which noise is extremely annoying. Commercial land use is less sensitive because of its time use but activity still requires communication which could be hampered by high noise levels. Activity in industrial land uses is primarily indoors where maximum permissible noise level standards are set by the Occupational Safety and Health Act (OSHA) of 1970. Attenuation necessary to achieve these levels are monitoring of employees is the responsibility of the industrial employer. Public and recreational land uses vary as to noise sensitivity and are used for less than a 24-hour period.

I - Noise levels in the exterior environment are compatible with the proposed land uses and will not create annoyance and activity interference. If a land use falls in this category, no additional noise studies or attenuation measures should be imposed on the builder.

II - Noise levels in the exterior environment are great enough to require study on the compatibility of the proposed land use. The proposed land use should be evaluated through the design, environmental review and site plan process to assess whether additional noise attenuation measures should be imposed.

III - Noise levels in the exterior environment are severe requiring a detailed analysis of the noise environment in relationship to the compatibility of the proposed land use. Noise attenuation features will be necessary in the basic design to insure the protection of persons occupying the land use.



The intent of this chart is to serve as a suggested guideline for reviewing the compatibility of land uses and noise levels. It is not intended to establish or imply any prohibition on activity, land use or property rights. It does establish, however, reference points, above which corrective action should be taken to protect public health and welfare.

Another planning guideline is the Noise Contour Maps which accompany the Noise Element. The noise contours depicted on these maps reflect transportation noise sources (i.e., highways, rail lines and airports) which are and will remain the major sources of noise in Orange County.

The contours shown on these maps indicate noise-affected areas which are referred to as Noise Referral Zones. Such a zone is defined as that area within the 60 CNEL, the level at which either State or Federal laws and standards related to land use become important and, in some cases, supersede local laws and regulations.

The intent of the Noise Referral Zone is to act as a triggering mechanism for any proposed change such as a zone change, subdivision, or building permit in an area affected by adverse noise levels. If a proposed land use change falls in a Noise Referral Zone, the change would be referred to the appropriate county agency for evaluation and review.

Noise contours tend to be very broad estimates of sound levels. In actuality, contour lines float over a defined area which is the Noise Referral Zone. Therefore, the use of zones provides a better method than contour lines for reflecting the true varying nature of sound.

For purposes of determining the consistency of development projects with this element, the following guideline shall be applied: Development projects for which a tentative tract or parcel map has been approved within 18 months prior to the adoption of this element shall be assumed to be consistent with the element unless it is shown that a significant threat to the public health exists if such project is approved.



# NOISE ELEMENT OF THE GENERAL PLAN EXISTING NOISE CONTOURS

AREA 1

AREA 2

AREA 3

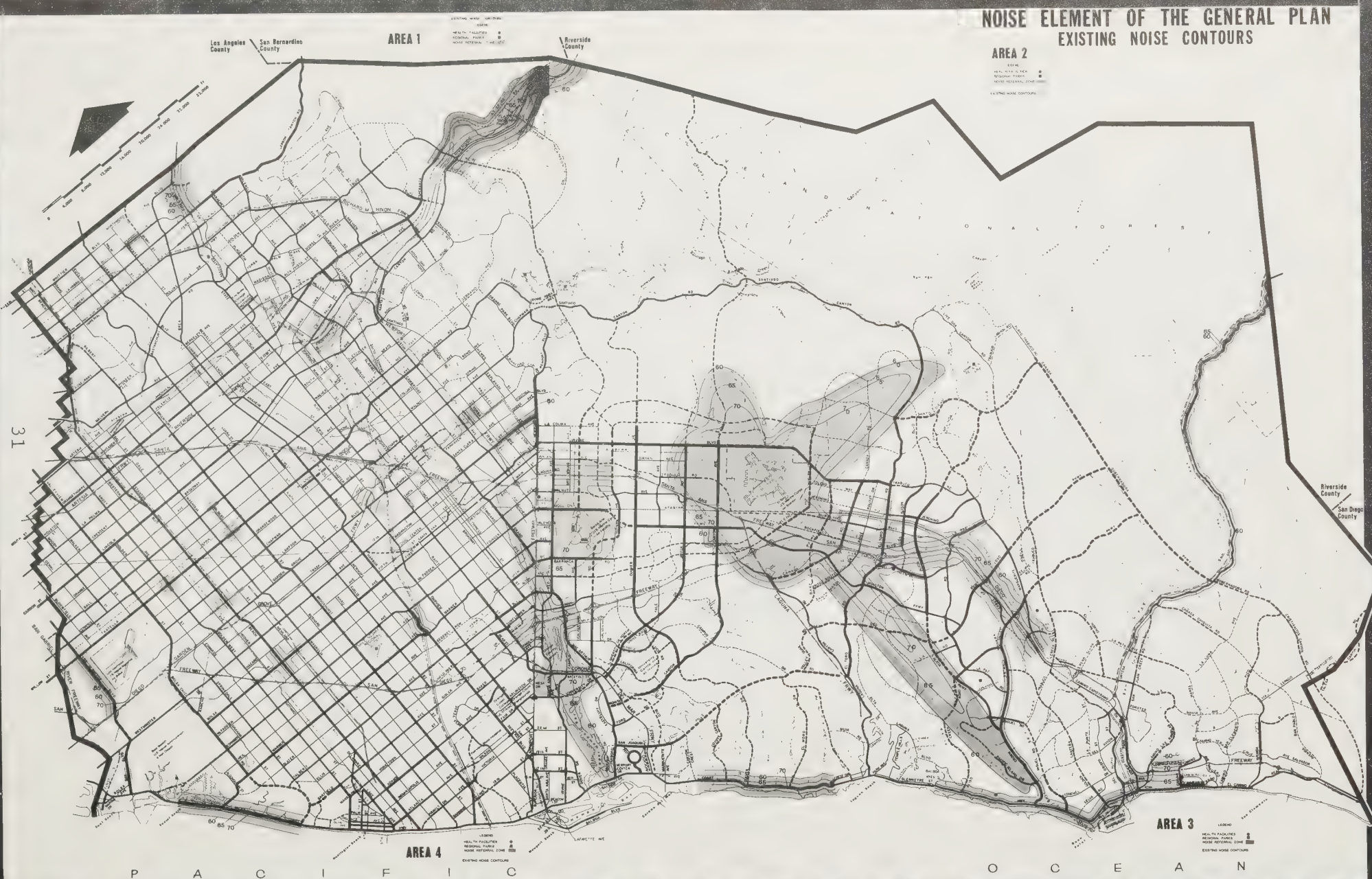
AREA 4

LEGEND  
HEALTH FACILITIES  
RECREATION PARKS  
NOISE REFERENCE LINE  
EXISTING NOISE CONTOURS

LEGEND  
HEALTH FACILITIES  
RECREATION PARKS  
NOISE REFERENCE LINE  
EXISTING NOISE CONTOURS

LEGEND  
HEALTH FACILITIES  
RECREATION PARKS  
NOISE REFERENCE LINE  
EXISTING NOISE CONTOURS

LEGEND  
HEALTH FACILITIES  
RECREATION PARKS  
NOISE REFERENCE LINE  
EXISTING NOISE CONTOURS



ORANGE COUNTY CALIFORNIA



# NOISE ELEMENT OF THE GENERAL PLAN ULTIMATE NOISE CONTOURS

AREA 1

Los Angeles County San Bernardino County

Riverside County

LEGEND  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS

AREA 2

LEGEND  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS

AREA 4

LEGEND  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS

AREA 3

LEGEND  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS  
HEAVY TRUCKS

P A C I F I C O C E A N  
O R A N G E C O U N T Y C A L I F O R N I A

32



### C. PROGRAM FOR MEASURABLE REDUCTION OF NOISE

A program for the measurable reduction of noise in the County should be developed in order to facilitate the implementation of the Noise Element.

Ambient Noise Monitoring - The County should continue its noise monitoring program based on public complaints and requests from other public agencies. This information should continue to be recorded and stored for use as future reference and as a means for measuring the County's success in meeting noise reduction goals.

Traffic Control and Regulation - Because community noise levels increase with traffic and percentage of heavy trucks, it is useful to regulate traffic and truck volume. These actions will be necessary at the local level until 1988 when the Environmental Protection Agency<sup>15</sup> and State of California<sup>16</sup> require truck noise emissions reduced to levels equivalent to most current automobiles. As a step in regulating traffic volume, the County should continue to encourage the use of public transit. The percentage of employees using public transit or car pools could be used as a measure of effectiveness in this effort.

The EMA should also develop a traffic/noise plan giving consideration to limiting truck volume or truck usage on streets with large numbers of residential dwellings. Trucks could be routed off County roads and onto freeways as preferential routes even where such routing is not the shortest distance between points. Truck routes could be kept at a minimum. Trucks could be scaled by weight to severely limit diesel tractor/trailer combinations.

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15

U.S. Environmental Protection Agency, "Final Noise Emission Standards for Motor Carriers Engaged in Interstate Commerce, "Title 40, Code of Federal Regulations, Chapter 1, Part 202.

16

"California Motor Vehicle Noise Limits", California Vehicle Codes; Sections 23130 and 27160.



Airport - Aircraft noise evokes the single most aggravated community response, even though highways constitute the most pervasive noise source. The County is currently preparing an environmental impact report on Orange County Airport. The County should study the impacts associated with OCA and alternatives and mitigation measures proposed for reducing the adverse noise effects. The County should then take feasible steps to eliminate these adverse impacts. Unfortunately, many of the planning guidelines offered will not be applicable as much of the land impacted is outside the County's jurisdiction. The County should continue to monitor airport noise at Orange County Airport to determine noise levels associated with this source.

In undeveloped areas affected by the El Toro Marine Corps Air Station, the County should continue legal measures to protect future residents. The existing 60 CNEL contours prepared for the MCAS appear adequate for planning purposes based on available information. There is considerable disagreement regarding the validity of established contours for the MCAS. If operations are significantly different at the MCAS, new contours should be prepared.

School Sites - Under Chapter 1.4, Section 216, of the Street and Highways Code, educational facilities should be measured by the State to evaluate compliance with the 50 dBA interior noise standard. The number of schools corrected per year by the State would be used as a measure of the progress in achieving noise compatibility in this area.

County Equipment - Because the public works activities of the County involve the use of mechanical equipment, noise reduction should be considered as a factor in the purchase of new equipment. Certain types of equipment are currently available with quieter noise qualities than those presently in the County inventory. Upon the adoption by the EPA of product standards for construction and service equipment, the County could review the EPA standards as guidelines in the purchase of new equipment.





## VI. ENVIRONMENTAL IMPACT

The Noise Element of the General Plan consists of a statement of community goals and objectives, the identification of community noise sources, and a program for the reduction of noise and the minimization of its impacts. The Environmental Impact Report attempts to analyze the effects of the policy and program recommendations of the Noise Element on the County of Orange. The EIR was prepared in accordance with Section 15037(a)(1) of the amended State Guidelines for Environmental Impact Reports which defines a project as including the adoption of local general plans or elements thereof pursuant to Governmental Code Sections 65100-65700.

The EIR appears in the Noise Element as follows:

<u>EIR</u>	<u>Element Text</u>	<u>Page No.</u>
Summary		iv
Introduction	Section I	1
Description of Existing Environment	Section II, III	5, 13
Description of Proposed Project	Section IV, V	21, 26
Environmental Impact	Section VI	35

### A. ENVIRONMENTAL IMPACT

The policies and programs of the Noise Element are directed toward maintaining or reducing noise levels so that noise will not jeopardize the health and welfare of the citizens of the County of Orange. As such, the implementation of the Noise Element will create impacts both negative and beneficial in the following areas:

1. Landform - Implementation of this Element may cause alterations in landform due to design measures (e.g., earth berms, walls) utilized to attenuate noise primarily from ground transportation sources. The magnitude

of this impact will vary depending upon the proximity of noise-sensitive land uses to transportation routes and dependent on funding capabilities to construct attenuation devices.

2. Social - Noise affects every facet of human existence - work, sleep, recreation, and education. Noise can be annoying and, in some instances, can cause physical and psychological damage. Noise may be particularly adverse in group interactions by limiting man's ability to communicate. The Noise Element will not contribute to any adverse social impacts of this nature and may relieve some. The Noise Element may, however, alter development trends in the County which could result in social impacts. Noise attenuating measures such as barriers could break up established neighborhoods. Increased setbacks might cause higher density.
3. Economic - The economic impacts of the Noise Element can be analyzed in terms of the costs of unregulated and unabated noise contrasted with the costs of programs to control or reduce noise sources. Implementation programs of this element have not been specified or are the costs related to those programs known. It should be assumed that implementation will fall somewhere between existing commitment and a total commitment to noise abatement, and that economic impacts will in part be costs resulting from noise and in part the cost of noise abatement programs.

The economic costs of noise or a no action implementation program would be reflected in wages, prices, productivity, production costs, employment, balance of payments, property values, and health.

Large numbers of people are presently being impacted by a variety of noise sources. The magnitude of these sources is already considered a severe environmental problem. More importantly, the growth rates of noise portend an even greater severity of noise

problems. Evidence exists which shows that sources of noise are expanding at a rapid rate. Particularly noise products such as motorcycles show a high rate of growth; the number of motorcycles has almost doubled in approximately four years. Air traffic has increased at a rate four times that of other modes of travel.

The problem of expanding numbers of noise sources is compounded by the trend toward increased population density. A greater concentration of people will result in more utilization of noisy products per unit area and thus a higher ambient noise level.

The implication of these trends can not be overstated - total noise generated in the environment will continue to increase in the near future and costs associated with noise will rise unless efforts are made to reduce substantially the noise output of these units.

Another implementation alternative of the Noise Element is in continuing existing county noise abatement programs, including enforcing state and federal regulations. The economic impacts of this approach would be the costs to the county for administering those programs, which the county is currently absorbing, as well as the costs to developers, landowners and homeowners for noise mitigation devices.

Since this approach does not completely protect the health of citizens from noise, to some degree the costs of noise will still be present. It should be assumed that since noise levels within the county are expected to increase in the future, these costs will rise.

Another approach is a maximum action alternative or the implementation of programs which will lower noise levels to the greatest degree of health protection. The costs of

this alternative would result from sound proofing all noise sensitive land uses within areas of unacceptable noise levels, installing barriers around all high noise generators, or acquiring land where land use - noise incompatibilities could not be mitigated. These costs would be borne by the county, homeowners and developers. With this alternative the costs of noise would be substantially reduced but at the expense of the county's overall economy, mobility, and environment.

4. Aesthetics - Noise attenuating measures such as barriers may either result in adverse visual impacts, depending upon the architectural and landscaping treatment given a particular wall.
5. Open Space - The Noise Element will result in both beneficial and adverse impacts for open space. Open Space may buffer noise-sensitive land uses or be noise-sensitive itself.
6. Noise - The Noise Element should result in the reduction of noise or the minimization of its impacts, both beneficial impacts.
7. Air Quality - Noise attenuating measures for ground transportation such as designated truck routes, slower speed limits, and depressed roadways may result in increased concentration of air pollutants.
8. Water Resources - The Noise Element will not impact water resources.

B. MITIGATION MEASURES AND CONDITIONS PROPOSED TO MINIMIZE THE IMPACT, INCLUDING BUT NOT LIMITED TO MEASURES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY CONSUMPTION OF ENERGY.

Mitigation measures to minimize adverse impacts resulting from the Noise Element are as follows:

1. Noise Attenuation Measures - The utilization of sound absorption material within homes and buildings provides an additional benefit besides noise reduction. Proper insulation



can retain heat and decrease the consumption of energy necessary for heating purposes.

2. Landform - Changes in landform can be accompanied by landscaping to improve the visual appearance.
3. Costs - The benefits of a noise control program in providing a quality environment will be increased efficiency, higher property values, fewer hearing difficulties, improved health, and maintenance of a quiet society. Certain noise-attenuation programs already mandated by the State and Federal governments will bear a portion of the costs.

#### C. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The unavoidable adverse effects associated with the Noise Element are:

1. Minor alterations of landform due to construction of noise attenuation measures.
2. Increased costs to enforce noise control programs, construct attenuation measures, and provide for additional services.

#### D. ALTERNATIVES TO PROPOSED PROJECT

The Noise Element contains a number of recommended policies focusing on the abatement and control of noise for the benefit of the citizens of Orange County. Various other alternatives to the proposed project are considered below.

1. "No action" alternative - This alternative was rejected because the Noise Element is required by State law. If the County did not comply, other levels of government would assume leadership in areas of noise reduction and the County would play a subordinate role.
2. "Minimum action" alternative - This alternative is directed at adopting a Noise Element that satisfies the minimum requirements of the State law. Current noise levels within the County are expected to

rise in the future if comprehensive noise abatement programs are not implemented. This alternative was not adopted since it did not offer a positive attack on the County's noise environment.

3. "Maximum action" alternative - This alternative would attempt to lower noise levels to the greatest degree that will protect the health of citizens. This alternative would have far-reaching and significant impacts of its own. All major surface transportation facilities would require redesign or the construction of attenuating walls and/or berms to reduce noise levels. Effective truck routing would be an essential component to reduce noise; however, total vehicle miles might increase as a result, thereby increasing county-wide air-pollution emission totals. Property around major airports would have to be purchased displacing people and increasing costs substantially. These are only a few of the primary and secondary impacts which would result from the implementation of the "maximum action" alternative. This alternative was, therefore, rejected because of the prohibitive costs to the County's economy, mobility, and overall environment.
4. "Other standards" alternative - The Noise Element could have been based on different standards. Other standards could have been more restrictive (EPA, "Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety,") or less restrictive (FHWA, "Design Noise Level/Land Use Relationships). The choice of different standards could entail more or fewer costs to the County. This alternative was not chosen in favor of the suggested guidelines incorporated in the Noise Element which were felt to balance environmental quality and economics.

E. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM  
USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE  
AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Over the short-term, the Noise Element for the County could cause disruption to existing and proposed land-forms, traffic patterns, revenue allocation, and the commitment of energy and resources. This Element will lead to the long-term improvement of the noise environment of the County in addition to better health for all residents.

F. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF  
ENERGY SUPPLIES AND OTHER RESOURCES SHOULD  
THE PROJECT BE IMPLEMENTED

Irreversible environmental changes involved in implementation of the Noise Element are as follows:

1. The commitment of energy and resources to construct and maintain noise attenuating efforts and monitor the results.
2. Alterations to landform.
3. Expenditure of funds to implement and service noise programs.
4. Transportation Alternatives - Alternative means of transportation such as mass transit, bus lines, bicycle lanes, pedestrian facilities, and car pooling may result in noise reduction and at the same time reduce energy consumption in transportation.

G. THE GROWTH INDUCING IMPACT OF THE PROPOSED ACTION

There is no direct growth-inducing impact involved in the implementation of this element. There may be secondary growth-inducing impacts in that some land uses may be encouraged or discouraged in certain areas by the addition of increased noise regulation and noise/land use planning controls.

The policies of the Noise Element will not result in increases in population or transportation. The Noise Element will, hopefully, reduce or minimize noise problems from the natural growth in these areas.

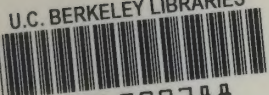








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